DARK ENERGY

Testing DECam on Telescope Simulator @ Fermilab

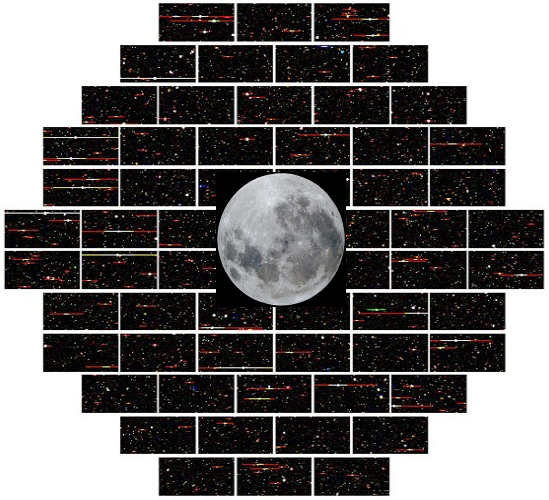
AEM 3/21/2011

Jiangang Hao
FCPA, Fermilab

Dark Energy Survey: Coming VERY Soon

DARK ENERGY SURVEY

- CTIO Blanco 4 meter telescope (in Chile)
- DECam: 2.2 deg FOV, 570 MegaPixels
- 5000 deg^2 southern sky in g,r,i,z,Y bands
- Map out 300 million galaxies
- Starting from late 2012 for 5 years
- Synergy with SZ cluster detection from South Pole Telescope



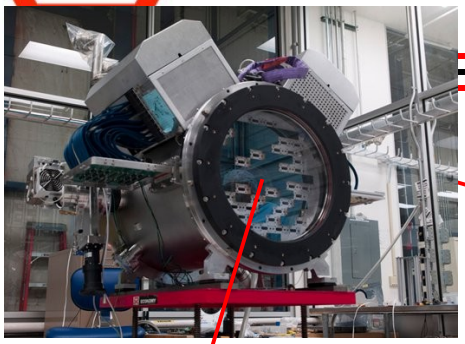
Key Instrument:

DECam, a 570 MegaPixel digital camera

Schedule:

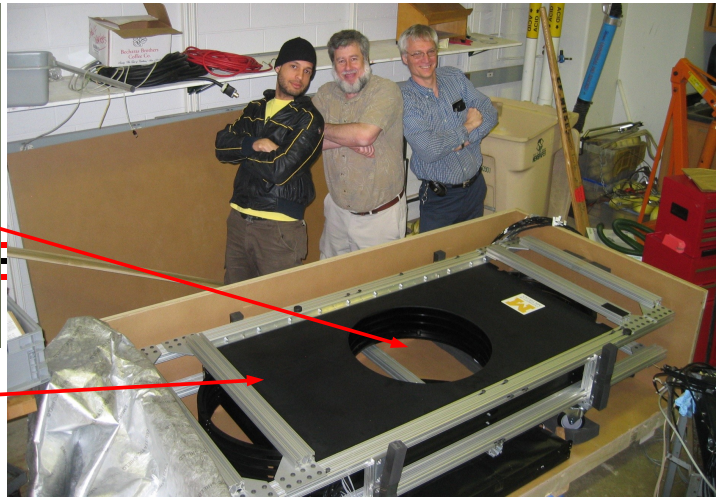
Shipped to CTIO (Chile) this May
Mounted on telescope: This November
First light: This December

DECam System

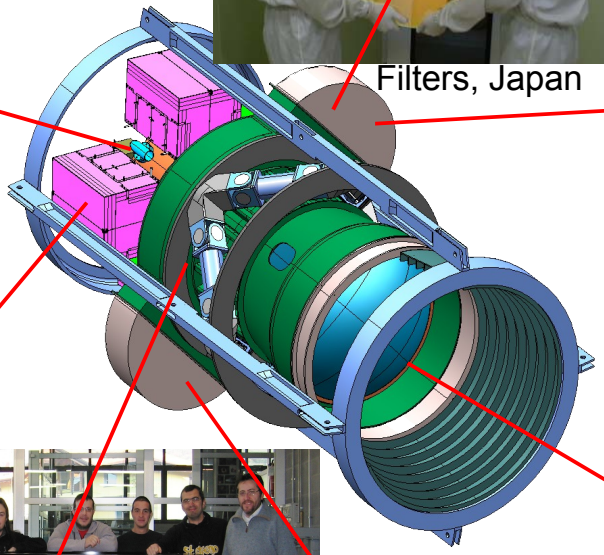


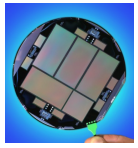
Imager, FNAL

Filters, Japan

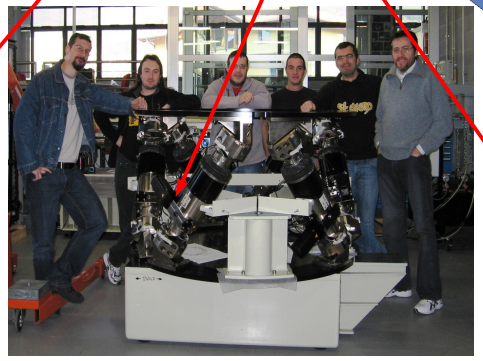


Filter changer, Univ. of Michigan

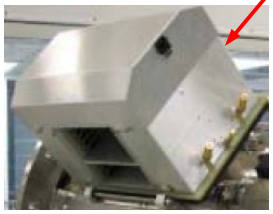




CCDs, wafer from LBNL, packaged at FNAL

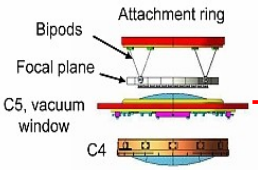


Hexapod, Italy



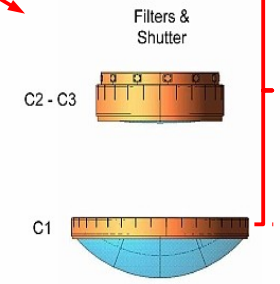
Electronics, Spain and FNAL

Shutter, Germany



Optics

ANL/FNAL

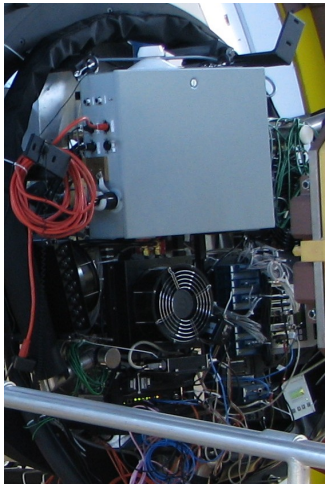


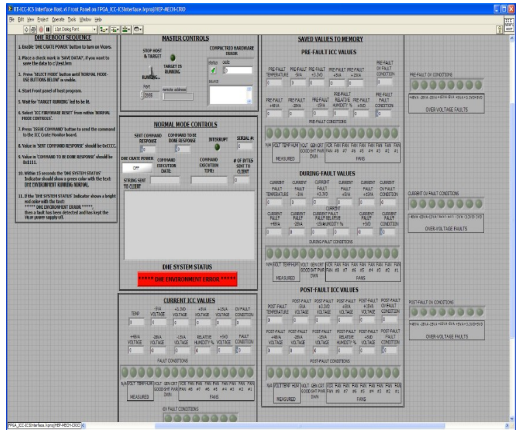
UCL@ UK

DECam Supporting Systems

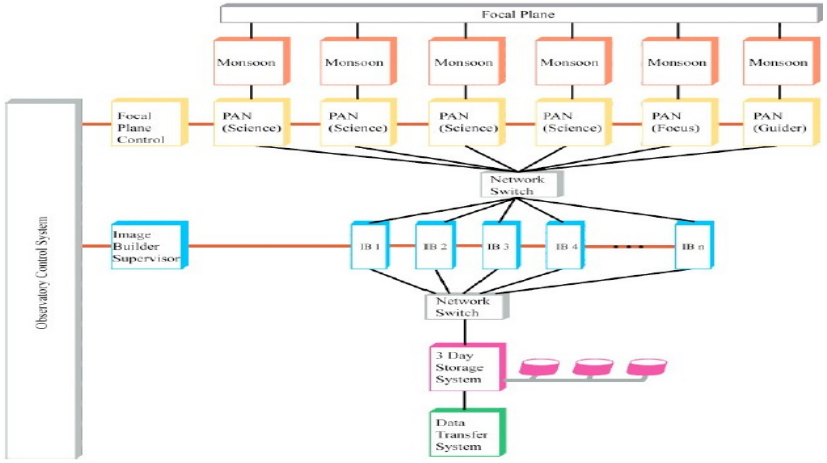
DARK ENERGY SURVEY

Cooling and Vacuum system, FNAL, Keep CCDs at 173K, 10^-6 Torr





Instrument control system, ANL, FNAL



THE DARK ENERGY SURVEY

SISPI GUI Interfaces

Apps

Observer Console | Comfort Display | Image Health | Architect Console

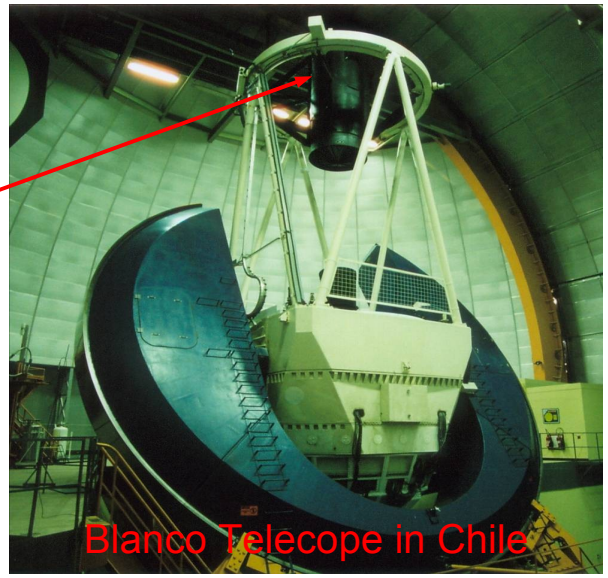
Variable Viewer | Exposure Table | Alarm Viewer

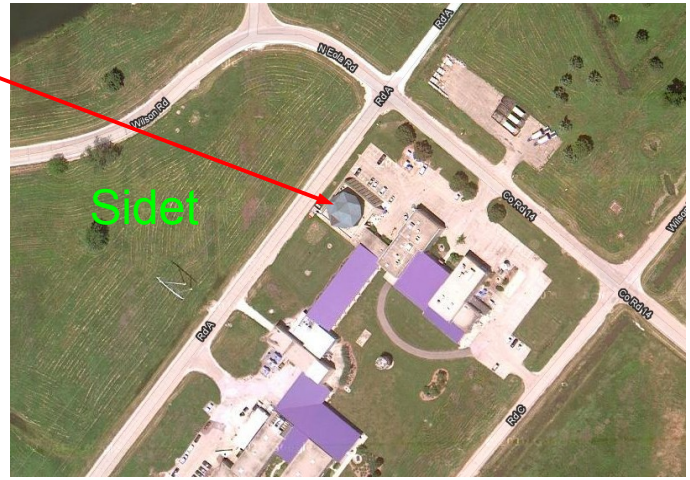
image coming soon | image coming soon

Overall control system: SISPI OSU, UIUC, FNAL

Telescope Simulator: testing all of them together

DARK ENERGY





- Test all the components of DECam in a realistic setting
- Test the software – mock observing

Mock Observing

DARK ENERGY SURVEY

- **Invite experienced astronomers to "observe" using the SISPI system for 4 nights (4 hrs/night)**
- **All the components, shutter, filter, hexapod, etc were operated as in the real observation**

5 Night checklist

This section describes the sequence of procedures to be followed by the observers during the "night" of mock observing – as this will be done during the day at Fermilab, all times are given in US Central times. It covers all the steps necessary to accomplish the observing plan. We scale down the number of exposures to make the "night" last 3.5 hrs. We anticipate to have 4 realizations of the mock night: 2 per day, in 2 days.

Before sunset – 9am/1pm

1. Check that all the hardware is ready. The star projector must be off.
2. A session at the workstation should already be running. If that's not the case, log in as user sispi.
3. If SISPI is not yet running, open a terminal, get a new kerberos ticket and start SISPI from decamsrvr01:
   > ssh decamsrvr01
   > cd decam/architectures/simulator
   > setup Architect
   > architect -i mock_obs_n1 -c mock_obs.ini

   .....

-14 degrees elevation, just after beginning of Astronomical twilight – 11am/3pm

18. Observations in survey mode. ObsTac should jump automatically into this.
19. This is a good time to exercise procedures such as: pause, restart, etc. It is also a good time to explore and test the GUIs, look at telemetry information, check the headers.

-14 degrees elevation – 11:30pm/3:30pm

20. Stop Obstac. Start a sequence of standard stars at this time.

-7 degrees elevation – 12pm/4pm

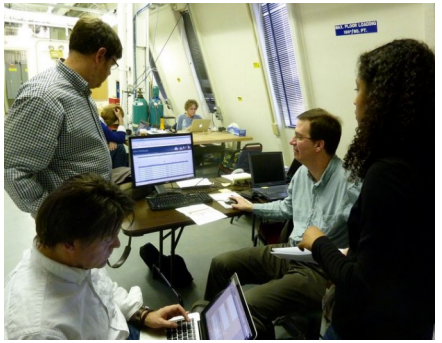
21. Take a sequence of dome flats (∼ 15 min):
    > execute mock_obs/flat_script

Sunrise – 12:15pm/4:15pm

22. Set system to safe:
    > FCS set Vsub Off
23. Make final edits to your log.
24. Complete the end of the night report.

End of the mock night – 12:30pm/4:30pm

From DES-DOC: 5267

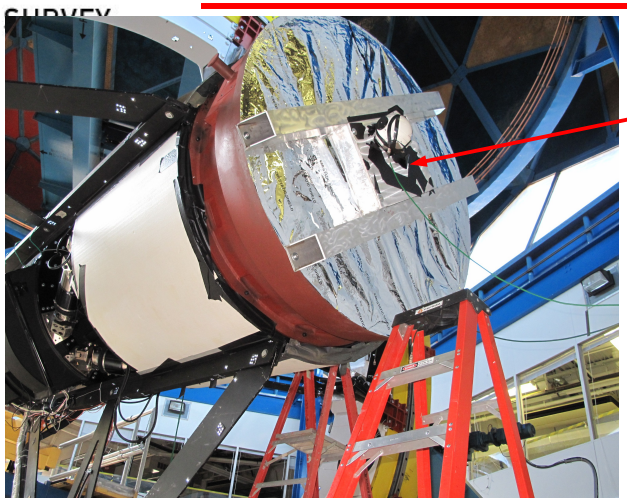


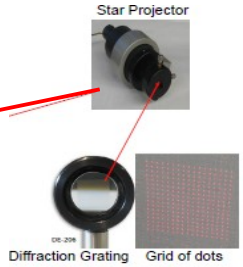
Photos courtesy of Marcelle

Mock observing was very successful!!
Both software and hardware work great!

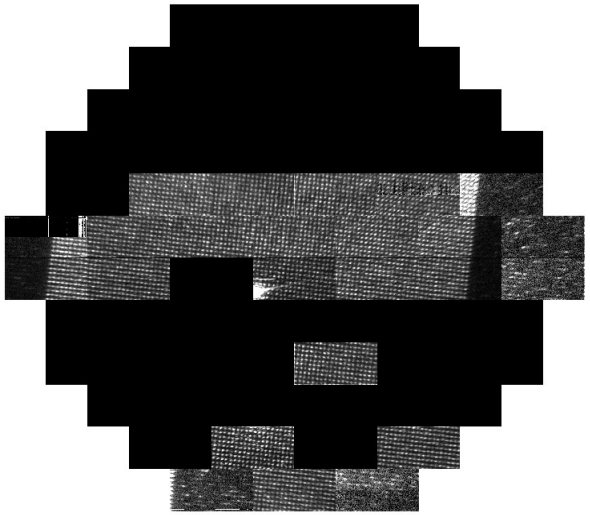
Image Based Measurements

DARK ENERGY SURVEY

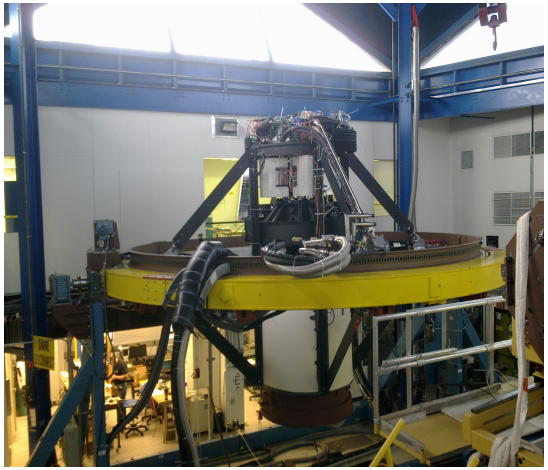


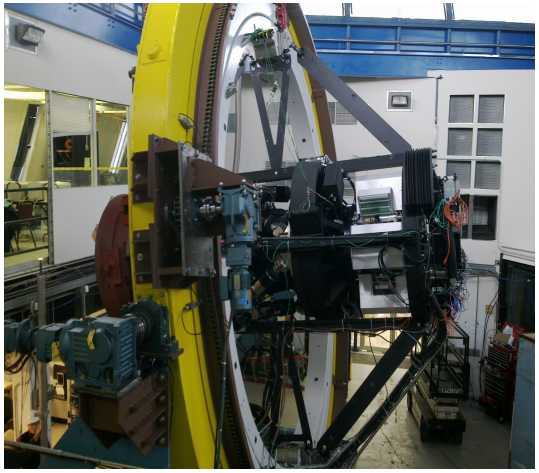


We project a grid of laster spots from a projector and take images using DECam



Different Orientations

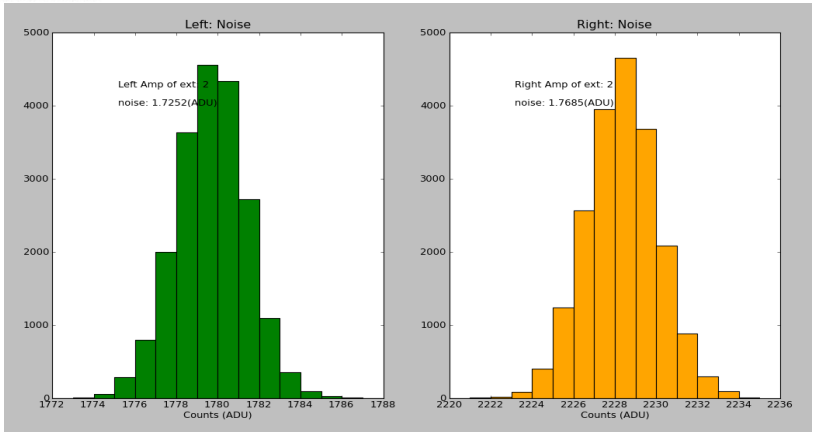




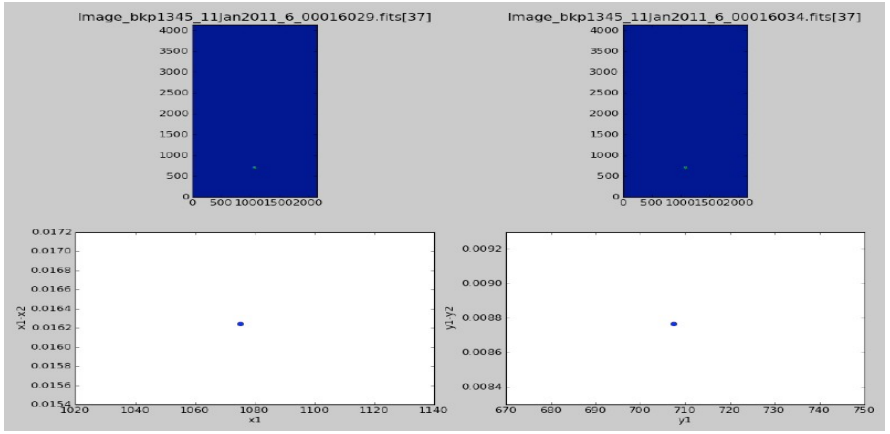
By analyzing the change of the grid patterns on the images, we can measure if the system is move consistently in different orientations.

Meets Specs

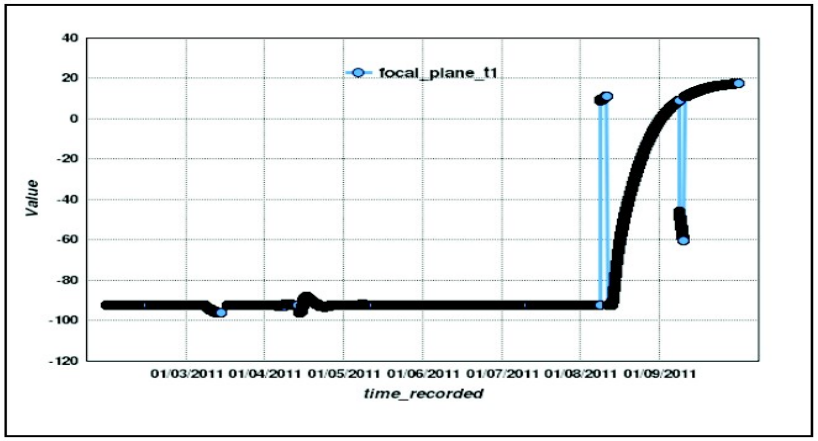
DARK ENERGY SURVEY



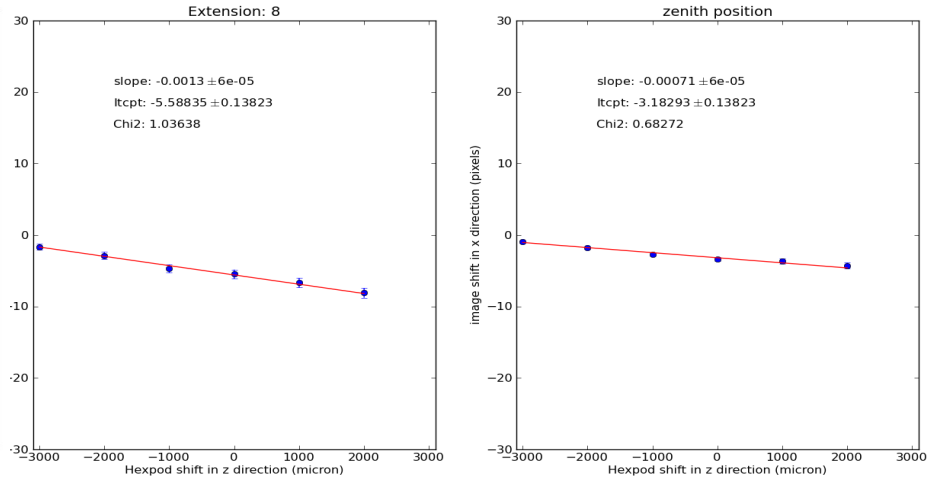
Readout noise meets spec



Filter reposition meets spec



Temperature stability and cooling system meet spec

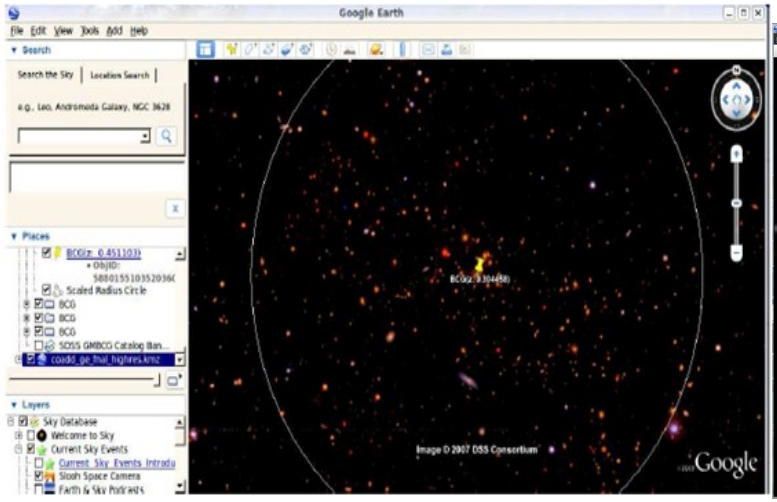


Hexapod moves smoothly

Viewing DES images in Google Sky

DARK ENERGY SURVEY

- Google Earth in Sky mode is a highly interactive way to look at sky images.
- We have published some SDSS Coadd images in Google Sky
- We will do the same for DES images. You will be able to fly around the DES images soon!



SDSS Coadd images

One Image from DECam

Next ?

http://www.youtube.com/watch?v=VvogFo29Hl4


Thanks to everyone working on the
DECam project to make all these happen!